

ABSTRACT OF THE DISCLOSURE

A method for forming a bottle-shaped trench. A
conductive layer surrounded by a doped layer is filled in a
lower portion of a trench formed in a substrate. A doping
5 region is formed in the substrate around the doped layer by
a heat treatment. A collar silicon nitride layer is formed
over an upper portion of the sidewall of the trench. The
conductive layer and the doped layer are successively
removed using the collar silicon nitride layer as a mask.
10 The doping region is partially oxidized to form a doped
oxide region thereon. The doped oxide region is removed to
form a bottle-shaped trench. A conformable rugged
polysilicon layer is formed in the lower portion of the
bottle-shaped trench.